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FAILURES IN CHEMISTRY 211.0

J. R. Ufford

For some time, the Chemistry Department has been concerned with the failure rate in the first year course in Chemistry. A few years ago, the writer started an investigation into the possible causes, using data from the Day Division.

The following possibilities were considered as worth investigation:

(1) The course content

(2) The examinations

(3) The students' and their backgrounds

(4) The teaching

The syllabus of the course has been worked on by the department for a number of years. It now consists of essentially the same material as is presented in Grade XII of the Protestant Schools of the Province of Quebec. An examination of the text books, which are in current use for similar courses at other universities, shows that the material is basically the same as in our course.

The examinations given in the 1960-61 session were analyzed by constructing scattergrams. The results obtained by a student for each question on the exam were plotted against his overall results on the paper. On the assumption that a student who obtained a high mark on the exam should obtain a high mark on each question and that a student who obtained a low mark on the examination should obtain a low mark on each question there should be a linear relationship between these two variables. If most points on a diagram were above this line, it would indicate the students' found the question easy. If they were below the line, it would indicate the students' found the question difficult.

The mid-term exam consisted of four essay questions and four problems and the students were required to do three of each. The analysis showed the students found one essay question easy, one difficult and two in between; the four problems were found to be intermediate. The final exam consisted of eight questions which the students were required to answer. Five were found to be easy, two difficult and one intermediate. The two difficult questions accounted for less than 20% of the paper.

The mid-term exam this year was an objective type patterned on those produced by the American Chemical Society. A set of norms is supplied by the A.C.S. for these exams. A set of norms calculated for our students shows that our better students are not quite as good as those used in setting up the A.C.S. norms, but that our other students are equivalent to theirs. This should not be surprising in view of the entrance qualifications submitted by our Day Division students. When the results of this list were combined with an essay type class test the failure rate increased by 10%. It would seem that one way to decrease a failure rate is to take no account of a student's ability to express himself.

An attempt was made to find a correlation between the results in Chemistry 211.0 and other factors, but for the most part these were not too successful. Among the data examined were: Grade XI averages, Grade XI results in English, Chemistry, Algebra, guidance office results in numerical aptitude, verbal and abstract reasoning. It was found that all students who obtained less than 60% in Grade XI Chemistry failed Chemistry 211.0, but on the other hand a high proportion of students who had had no previous Chemistry completed the course successfully.

An examination in Elementary Algebra and Arithmetic was administered to the students. The correlation between the results of this and Chemistry results was fair. On this test it was shocking to find that 85% of the class could not correctly find five per cent of thirty !

This year the Iowa Chemistry Aptitude test was administered to the students and no correlation was found between this and exam results. However, it was found that all students who obtained less than 60% on the reading section of the aptitude test were unable to pass the Chemistry exam.

No attempt was made to examine the teaching of the course for two reasons: first of all, it is difficult to do, and secondly, the author could not do it objectively.

It would seem that one way to reduce the failure rate in this course would be not to register students who had less than 60% in Grade XI Chemistry and in the reading section of the Iowa Chemistry Aptitude test. Perhaps these students could be salvaged by being required to take a non-credit course in Elementary Mathematics, reading skills and study methods before registering for Chemistry 211.

ON THE INTERACTION OF TEACHING AND RESEARCH

W. R. Raudorf, Department of Physics

Although instruction and research operate as an established partnership in our universities there are many aspects of competition and interference between them.

A research man is often a teacher with his research hat on, but there are many teachers who do not possess such a hat, and there are many research men around our universities who have no teaching responsibilities.

We ought to be concerned with the interaction of these two activities in a university, and with how they aid or obstruct each other.

This is a fairly modern problem, for research was not uniformly supported by American universities until the present century.

Today research is so generally accepted as one of the great natural functions -- if not the main function -- of any institution granting higher degrees that one can hardly imagine that for centuries universities were just teaching institutions.

Even at the end of the nineteenth century eminent presidents of Harvard, Cornell, John Hopkins universities declared that teaching was much more important than research, a proposition which at that time was denied nowhere except at the University of Chicago.

But the spirit of research was stirring, and the American Physical Society came to birth right along with the new century. That organizational step was brought about mainly by teachers who wanted to do research.

Here a little and there a little research came into the universities, and it would be ridiculous to claim that it did not compete with the teaching function.

It is told that when Michelson was asked how he managed to get so much good research done, he replied "By neglecting my students."

That's a practice that did not die with Michelson. Now it is the undergraduate student who suffers in such cases.

The close association of an advanced student with a strong research man can be highly educational in an unsystematic way, quite apart from any conscious didactic operations. It is an apprenticeship. It was even said at Chicago (where Michelson worked) that the best training for a graduate student was to carry water for Michelson. Some of the greatness of Socrates seems to have rubbed off on his student, Plato, and it was not transferred by the lecture system, for Socrates did not believe in the lecture system.

But it does an undergraduate little good to sit in the presence of a scientist of reputation unless the great man says or does instructive things.

When teaching moved over to make room for research -- around 1900 and thereafter -- some educators and scientists who believed strongly in both activities, tried to play down the mutual interference. These coexistentialists were heard advancing three propositions:

First, every good research man is ipso facto a superior teacher.

Second, it is not possible for a non-research man to be a superior teacher.

Third, the partnership of research and instruction is always mutually beneficial.

These assertions, however, were not inductions from any real observations; they were just articles of faith, adopted, not derived. The weight of observations is against them all, but they were attempts to deal with a real problem which is still unsolved: the problem of promoting the mutually helpful coexistence of instruction and research. Since these three claims may still be heard occasionally, it is worth while taking a closer look at them.

The first one was strongly worded by President David Jordan of Yale University, who said, "I very much doubt if any really great researcher was ever a poor teacher." Seemingly President Jordan had not heard of the many research workers who have failed so completely as teachers that they had to be replaced. Most of us who have been graduate students can remember sitting before at least one honored - and justly honored - research professor who for one reason or another was unsuccessful in the classroom. Possibly he was bored with teaching and considered it an unimportant part of a job that he had taken mainly to be able to do his research. Fortunately a scholar of this type no longer needs to suffer in the classroom. Certainly not in the physics classroom. He can now get a better job requiring the full-time use of his high talents.

I am not suggesting that there is any negative correlation between effectiveness in research and teaching, but only that the positive correlation is a long way from unity.

In turn to the claim that a man not doing research, or not eager to do research, can never be a superior teacher.

The affirmative argument holds that one never really understands the nature of physical phenomena; never grasps the reasons behind the reasons until one digs clear to the bottom of extant knowledge and then a little deeper.

This argument sometimes maintains that book learning is fine if you want verbal knowledge, but research people are doers of the word and not hearers only. The superior teacher should have buried himself in the physical mysteries and drawn out the truth with eyes, ears, tactual nerve endings, and the sense of smell.

Experience in research has improved many a teacher's comprehension of the nature of science and greatly deepened his understanding of specific problems. However, the subject matter field is wide, life is short, and research is narrow. There is not time enough, for instance, to master the whole of physics through direct research experience, and the detailed insight that a man has time to secure in this way will rarely be passed onto his students, unless he is giving a seminar in his research specialty.

How can the intensive research specialist find time to understand the rest of physics. As teachers we all need perspective. We need to know where the frontier of physical knowledge lies and how the fight for its expansion is going on in the various sections. A man who is intensely preoccupied with the tactics of one section may have less chance to see the whole situation clearly than will an equally earnest and intelligent man who pulls out of the fight and merely studies from headquarters.

This, after all, is what the well-rounded theoretical physicist does. Instead of performing experiments, he reads and thinks and talks about the experiments of other people. Surely we have theorists who have gained an enviable comprehension of physics by this process, and it is very doubtful that we can find our experimentalists so well informed as to feel superior to them all. The method of the theorist -- that is, mastering science by reading literature instead of meters -- is open to every teacher who lives near a library to the degree permitted by his mentality, his temperament, and, of course, his time commitments. The teacher who chooses this method of learning has no reason to feel that his colleague who reads meters has a superior pipeline to the sources of enlightenment.

To draw the conclusion that the doing of research per se makes the superb physicists is an elementary logical fallacy.

Now a word about the third axiom that the association of instruction and research necessarily benefits both.

It is easy to see that each depends upon the other, for it was research that gave the teacher something to teach, but without the teacher's support research would die out tomorrow for a lack of trained workers.

Some individual scientists have found the combination advantageous in their own lives. Hans Christian Oersted discovered electromagnetism while in the very act of demonstrating before an audience. Sir J. J. Thomson writes in his autobiography that the bright, inquiring minds of students kept him from settling into fixed mental postures, while their questions sometimes stirred him to think along lines conducive to discovery. Well, everyone wishes it might always work this way, but does it?

In the life of a university department, the interests of research and teaching are competitors. It does not mean that members of a department must necessarily engage in controversy with each other in the promotion of these rival activities, though this may happen. It means that the activities themselves are in necessary conflict in any department which thus seeks to serve two masters. These activities compete for room space, for funds, for the working time of staff members, and for the control of faculty appointments. Most scholars claim that the demands of research and of teaching have been in continual conflict during their entire career and that they cannot remember that either function ever helped the other. Many a lecture would have been better prepared and many a student better served if the urgency of some situation in the research laboratory and the fascination of it had not pulled the interest away from teaching.

On the other hand the continuous concentration that a research dilemma can demand was often broken up by the class bell. They would have done better at either one of these activities, if they had kept out of the other.

To get universities solidly into research required some neglect of teaching. President Harper at Chicago announced for instance, that the promotion of faculty members will depend more largely upon the results of their work as investigators than upon the efficiency of their teaching, thus reversing the policies of great presidents of the preceding generation.

Such a declaration seems a wide open invitation to the faculty to neglect their students and a justification of Michelson's behaviour.

The Harper policy (supremacy of research) is now in effect in nearly all the larger universities on this continent. For two generations now university research has received indulgent consideration and like an infant industry, research has benefited from certain protective tariffs.

It is no longer an infant, in physics at least, and it is in no need of further protection.

It does seem that it is high time to swing the protective tariff back from the researchers to the teacher as teacher.

It is not necessary to go back to the nineteenth century but perhaps to a status appropriate to the needs and conditions of our time.

UNIVERSITY CORRIDORS

Keith Crouch, the University Librarian, takes over on May 1st----- Harry Clinch is the new Chairman of the Library Committee. Don Peets taking staff members on tours of the new faculty offices on the fifth floor----- we hear this area is really nice.----- That was a fine review the Stratford visit received in the local press-----full marks to Neil Compton. That appearance on Viewpoint by Arthur Lermer was a Sir George "first". Bill Black, the Faculty Club President, is Arctic bound soon after the exams finish----- Doug Insleay is the new Secretary Treasurer of the Ottawa St. Lawrence Intercollegiate Athletic Association.

Everyone is pleased to hear that Dr. Hall's retirement will be from the Principalship only, and that he will be staying with us in another capacity. Hope this will include writing the History of Sir George. He will deliver the Convocation address on June 1st.

This year's Graduation Class President is Mr. Richard Leslie, and Dr. Murray Ross, President of York University, will deliver the Graduation Banquet Address.

University planning has successfully hurdled the first stage and all briefs are now with the architects. J. P. Petolas is the Secretary of the University Committee on Development and will assume an increasingly important role as time passes.

The recent Alumni Reunion was a success and John Ferguson, the Alumni Secretary, was the man behind the scenes on this program. Mr. Peter Vita, a former S.U.S. President and member of the Garnet Key, has been appointed Administrator to the Students' Undergraduate Society effective April 15th.

Provincial Government Bursaries and Scholarships to our students totalled over $92,000.00 during the 1961-62 academic year.

EXTRACURRICULAR COMMITTEE

The Faculty Council have approved the following appointments to the Extracurricular Committee: Associate Professor F. W. Bedford, Mr. D. Burke, Assistant Professor K. Jonassohn, Mr. C. Nish, Assistant Professor L. Sherman and Assistant Professor Sinyard. Members of the Dean's Office and Student Affairs Office complete the Committee

The Committee is a sub-committee of the Faculty Council and relates to the Student Life of the University. Associate Professor Bedford is the Chairman and Mr. W. D. Johnstone acts as Secretary.

TELEVISION

Now that the current series "University" has been completed, preparation for the formal credit program has been started. Sid Lamb will give Shakespeare 253 next fall and the filming will take place in the C.B.C. Studios.

Bill Rice, the producer of "University" will be taking over "701" for the summer while popular Syd Davison, the announcer, has been signed to a C.B.C. contract.

CREDIT UNION

The annual meeting of the Strathcona Credit Union is scheduled for Thursday, May 24th at noon. At that time, the officers for next year will be proposed, the dividend declared and the interest rebate percentage announced.

If you are not in our Credit Union, see Mr. N. Elliot, the Manager, for full information concerning the advantages of membership.

FACULTY CLUB

Bill Black is the President of the Faculty Club with Henry Worrell as Vice-President. Rytsa Tobias is the Secretary, and Don Burke will handle the money. Members of the Social Committee are Cameron Nish, Bob Curnew, Fred Sauer and Fred Bedford.

GRADUATION BANQUET AND BALL

The Graduating Class of '62 extends an invitation to the members of the part-time Faculty to attend this year's Banquet and Ball, to be held at the Queen Elizabeth Hotel on Saturday, June 2nd, 1962 and commencing at 8:00 P.M.

Subscriptions are $16.00 (Sixteen Dollars) per couple and dress is formal. Tickets may be purchased at the Accounts Office. The Guest Speaker will be Dr. Murray Ross, the President of York University. Music will be by Stan Bankley and will be supplemented by a Ukranian folk-dance group who will present some of their national dances.

Representatives of all previous graduating classes, as well as the entire first graduating class, will attend as honoured guests.

The Grad Class Executive of '62 are most eager to welcome members of the part-time Faculty to this most auspicious occasion, celebrating as it does the twenty-fifth Anniversary of the University.

UNIVERSITY DATEPAD

(No Set Date)	SGWU - CAUT Elections
Tuesday, April 24th	First Day of final examinations
Wednesday, May 9th	Last Day of final examinations
Thursday, May 24th	Strathcona Credit Union Annual meeting
Sunday, May 27th	Baccalaureate Service
Monday, May 28th	Mont Gabriel Conference
Tuesday, May 29th	" " "
Friday, June 1st	Convocation
Saturday, June 2nd	Graduation Ball